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International Financial Market and Japanese Interest Rate

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I. Introduction

This article attempts to examine two interrelated issues: the integration and the efficiency of Japanese financial markets. The central issue is whether the financial market of the Japanese economy has been effectively separated from the major international markets under the current exchange rate regime. To minimize external shocks, interest rates have been traditionally placed under the control of the monetary authorities. However, the rapid development of domestic short-term financial markets was hardly compatible with traditional policy. Growing pressures thus forced the adoption of new measures with fewer restrictions. Yet many questions remain unanswered. Among them, for example, to what extent was the domestic financial market integrated into the international market? If there was a degree of integration, is it appropriate to assume that the domestic interest rate was exogenously influenced by external events? When the domestic market is found to be integrated internationally, can this market be regarded as efficient in the sense that all profit opportunities are systematically exhausted?

This point is very crucial for the formulation of domestic as well as of international monetary policies. Under a flexible exchange rate regime, if the authorities try to follow an exchange rate adjustment policy via selective intervention, then this implies a partial loss of control of money supply developments. However, incomplete openness in the capital market would limit the exchange rate adjustment. This might have consequently led to a situation where the foreign exchange rate was excessively abused.

The next section tries first to test the hypotheses that there has emerged a systematic channel of international capital integration between Japan and the rest of the world. As a matter of facet, there has been a dramatic growth of short-term financial markets in Japan throughout the 1970s. Therefore,

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it is interesting to examine whether such market growth has increased in line with the increasing integration with other capital markets.

The third section analyzes the efficiency question of the domestic financial market. In that section we will see that the results of the first two sections are not unrelated. The concluding remarks are given in the final section.

II. International Integration of the Japanese Short-term Market

The Testing Procedure

The primary aim of this section is to test the hypothesis that the level of Japanese interest rates has been unrelated to the level prevailing on financial markets abroad. Rejection of this hypothesis implies that the interest rate policy has less effect on domestic monetary policies, contrary to what had been thought to be the case in the past. The scope of this study is limited, because the entire financial markets are far more complex and cannot be fully covered in this short paper. In addition, it is very crucial but difficult for an empirical study to identify what are comparable markets in different countries, because of several crucial factors such as differences in risks, currency denomination, and transaction characteristics.

After examining various foreign markets, the short-term yen rate on the Eurocurrency market was chosen for comparison with the Japanese financial market *gensaki* rate.[1)]

It has been widely recognized that the Eurocurrency market is an established center of international financial transaction. Marston (1976), for example, demonstrated how interest rates in the non-dollar Eurocurrency markets are determined simultaneously so as to lead to a close interest parity equilibrium among major currencies. Most participants in the Japanese short-term financial markets are in the position to acquire immediate information on developments in the Eurocurrency market. And there is no doubt that despite continuing Bank of Japan restrictions, de facto they are not domestically constrained. Their international transactions are thus expected to be less costly if they participate in the efficient Eurocurrency market. In this respect, the barriers of different risks, the currency denomination problem and differed transactors could be significantly lessened, when comparing the Japanese interest rate with the Euro rate.

Related studies, developed for the case of U.S. interest rates and interest it is interesting to examine whether such market growth has increased in line with the increasing integration with other capital markets.
rates on Eurocurrency markets, also showed the existence of close financial linkages. Hendershott (1967), Kwak (1971), and Herring and Marston (1977) are among some of these earlier works. However, most of them assumed, explicitly or implicitly, that U.S. interest rates are not affected by external financial markets. This implies that all these studies disregarded the possibility of simultaneous integration of both markets. There was a general understanding that the U.S. domestic financial market is far larger than most other external markets.

Recently, Hartman (1981) questioned such an assumption by arguing that it may no longer be consistent with the rapid expansion of international financial markets. Contrary to earlier studies, he found the existence of simultaneous determination even between Eurodollar and U.S. domestic interest rates. And he stressed that the impact of external factors on the U.S. market can be identified as a relatively recent phenomenon.

To test the extent of short-term capital market integration one can compare the yields of comparable assets in different countries. The results of this kind of approach can confirm the existence of interrelationships between financial markets, but they rule out the possibility of domestic policy having an impact on domestic interest rates. Such comparison of interest rates levels is thus a test of whether markets are closed or open.

For an empirical test of integration or disintegration two implications of Dent-Geweke (1980) are employed. The model can be described by the equation

$$B(L)y_t+H(L)x_t=u_t \tag{1}$$

where y_t is the realization of a time series of g endogenous variables and x_t is the realization of a time series of k exogenous variables.[2] $B(L)$ and $H(L)$ are matrices of polynomials of the lag operator. u_t is the realization of g disturbances. The empirical tests to be performed are two implications of exogeneity derived from Equation 1.

The first implication of exogeneity is

$$y_t=\sum_{s=-\infty}^{\infty} K_s x_{t-s}+v_t \tag{2}$$

Where $\{x_t\}$ and $\{y_t\}$ are jointly covariance-stationary and cov $(v_t, x_{t-s})=0$, for all s and t. $K_s=0$ for all $s<0$ is required if x_t be exogenous.

The second implication is

$$y=\sum_{s=1}^{\infty} F_s x_{t-s}+\sum_{s=1}^{\infty} G_s Y_{t-s}+e_t \tag{3}$$

where cov $(e_t, x_{t-s})=0$ and cov $(e_t, y_{t-s})=0$ for all $s>0$ and all t. In this specification, it is noted that there exists a dynamic simultaneous relation with x_t and y_t and no other variables if, and only if, $G_s=0$ for all $s>0$. In this way of testing, this particular implication embodies the notion, according to Dent-Geweke (1980 p173), that 'however x_t is determined, this determination does not depend on y_t. To test this idea we need not specify the appropriate model for x_t: under the null hypothesis of exogeneity x_t is correlated with past values of y only through their mutual dependence on lagged x_t and hence only the latter need be included in the equation for x_t.'

When the domestic interest rate r_t is hypothesized to be generated autoregressively, two tests of interest rate dependence can be performed by equations (4) and (5)

$$r^d{}_t=\sum_{i=-n}^{n} K_i r^f{}_{t-i}+e_{1t} \tag{4}$$

$$r_t{}^d=\sum_{i=1}^{n} F_i r^d{}_{t-i}+\sum_{i=1}^{n} G_i r^f{}_{t-i}+e_{2t} \tag{5}$$

where r is the Eurocurrency rate. Similarly, we run the equations (6) and (7)

$$r^f{}_t=\sum_{i=-n}^{n} K' r^d{}_{t-i}+e_{3t} \tag{6}$$

$$r^f{}_t=\sum_{i=1}^{n} F'_i r^d{}_{t-i}+\sum_{i=1}^{n} G'_i r^f{}_{t-i}+e_{4t} \tag{7}$$

Both sets of two equations can be used to conduct tests of mutual dependence. The rejection of $K_i=0$ and $K_i'=0$ for all $i<0$ and of $G_i=0$ and $F_i=0$ is not the sign of r^f (or r^d) exogeneity to r^d (or r^f) but an indication of mutual dependence.

Statistical Test: Data and Results

For empirical testing a priori restrictions of lag length need to be imposed on the equations system. The lag lengths of two interest rates may be affected by the characteristics of the two short-term markets.[3] The two interest rates

are the three-month *gensaki* rate (r^d) and the three-month Euroyen deposit rate (r^f). The former is in principle free from Bank of Japan regulations while the latter is, of course, totally unresttricted.[4] Thus, due to the nature of these markets, it has been assumed, after several attempts, that a four week lag, $n=4$, is long enough to absorb any shock.[5] The two time-series used are for weekly data and span the period between 1978 and 1983.

The first implication of exogeneity, the F-statistic test for significance of future coefficients, is summarized in Table 1. For the entire sample period, the coefficients of future r^f's on current r_d are not significant. On the other hand, the coefficients of future r^d's on present r^f are significant. This indicates that the Euroyen rate was determined independently from the Japanese rates, but the opposite was not true. However, during this period, at least two important changes occurred in Japan's financial markets. One was the remarkable growth of short-term financial markets, including the *gensaki* market, due probably to the gradual relaxation of controls over such markets.[6] Another was the major revision of the Foreign Exchange Law of December 1980. A number of tests were performed to see whether the latter mattered in initiating financial integration with the Euro market and the results are reported in the second and third rows of Table 1. In the period before December 1980, the results are similar to those shown in the first row. However, after the period the F-statistics of significance of future coefficients of

Table 1 Test for Significance of Future Coefficients

Sample Period (Number of observations)	Future r^f's on current r^d	Future r^d's on current r_f
February 1978 to November 1983 (284)	$F_{4,275}$ =1.321	$F_{4,275}$ =14.294*
February 1978 to November 1980 (139)	$F_{4,130}$ =0.715	$F_{4,130}$ =11.781*
December 1980 to November 1983 (134)	$F_{4,41}$ =5.267*	$F_{4,41}$ =31.819*
February 1978 to January 1979 (50)	$F_{4,41}$ =0.251	$F_{4,41}$ =1.233
February 1979 to February 1980 (50)	$F_{4,41}$ =181.308*	$F_{4,41}$ =0.727
March 1980 to February 1981 (50)	$F_{4,41}$ =5.818*	$F_{4,41}$ =9.750*

Note: The asterisk implies that the F-statistic is significant at the 0.01 level.

Table 2 Vector Autoregression Results

	Dependent Variable: r^d			
Sample Period	February 1978 to December 1983	February 1978 to January 1979	February 1979 to February 1980	March 1980 to February 1981
Constant	0.118	0.3806	−0.1355	0.6505
	(0.0457)	(0.2236)	(0.1259)	(0.3930)
r^d_{t-1}	1.3896	1.3371	1.8775	1.0082
	(0.0605)	(0.1519)	(0.1670)	(0.1562)
r^d_{t-2}	−0.4790	−0.5565	−1.1755	−0.2823
	(0.1029)	(0.2560)	(0.3412)	(0.2216)
r^d_{t-3}	0.0490	0.3254	0.2124	−0.2599
	(0.1018)	(0.2501)	(0.3898)	(0.2211)
r^d_{t-4}	−0.0001	−0.1947	0.1072	0.1868
	(0.0568)	(0.1461)	(0.2119)	(0.1326)
r^f_{t-1}	1.1074	0.0270	−0.0769	0.2479
	(0.0191)	(0.0395)	(0.0446)	(0.0507)
r^f_{t-2}	−0.0046	−0.0033	−0.0507	0.1202
	(0.0219)	(0.0507)	(0.0489)	(0.0579)
r^f_{t-3}	−0.0385	−0.0015	−0.0119	−0.0265
	(0.0218)	(0.0513)	(0.0487)	(0.0596)
r^f_{t-4}	−0.0387	0.0010	−0.0070	−0.0705
	(0.0197)	(0.0401)	(0.0407)	(0.0568)
R^2	0.9935	0.9321	0.9913	0.9695
SER	0.1640	0.1499	0.1390	0.2579
F tests for significance of lagged Euro rates	$F_{4,279}$ =10.414	$F_{4,41}$ =0.216	$F_{4,41}$ =0.809	$F_{4,41}$ =4.117*

Note: Ordinary Least squares was used to fit each equation. The figures in parentheses are standard errors. (*) implies the F-statistic is significant at the 0.01 level.

r^f on r^d and of future coefficients of r^d on r^f are 5.27 and 31.82, respectively. These are statistically significant at the 0.01 level. This result implies that the two rates are no independent from each other. Various sub-periods were chosen for further tests. The last row provides interesting results which are similar to those of the third row. They seem to suggest that the mutual dependence between the two markets became clearly established around 1980.

The second implication is illustrated in Tables 2 and 3. Contray to the first test, the F-statistics for the entire period, 10.41 and 10.80, are significant

Table 3 Vector Autoregression Results

	Dependetn Variable: r^f			
Sample Period	February 1978 to December 1983	February 1978 to January 1979	February 1979 to February 1980	March 1980 to February 1981
Constant	0.0918	0.9839	−0.1444	0.3810
	(0.1436)	(0.8911)	(0.4410)	(1.2311)
r^d_{t-1}	0.6143	−0.1427	1.1753	1.0397
	(0.1902)	(0.6053)	(0.5851)	(0.4899)
r^d_{t-2}	0.1774	−0.4428	−0.9297	0.8016
	(0.3231)	(1.0202)	(1.1957)	(0.6950)
r^d_{t-3}	−1.3407	0.8127	0.4734	−2.0396
	(0.3196)	(0.9965)	(1.3661)	(0.6931)
r^d_{t-4}	0.5687	−0.3017	−0.3819	0.7681
	(0.1783)	(0.5822)	(0.7427)	(0.4157)
r^f_{t-1}	0.6250	0.8363	0.4495	0.3177
	(0.0600)	(0.1573)	(0.1565)	(0.1590)
r^f_{t-2}	0.1905	−0.0955	0.1537	0.1337
	(0.1686)	(0.2019)	(0.1713)	(0.1817)
r^f_{t-3}	0.1631	0.1104	0.1107	0.0019
	(0.0684)	(0.2045)	(0.1706)	(0.1868)
r^f_{t-4}	−0.0102	−0.1147	−0.0000	−0.0305
	(0.0618)	(0.1600)	(0.1428)	(0.1781)
R^2	0.9696	0.9570	0.9452	0.8234
SER	0.5152	0.5972	0.4870	0.8086
F tests for significance of lagged domestic rates	$F_{4,279}$ =10.804*	$F_{4,41}$ =0.321	$F_{4,41}$ =2.645**	$F_{4,41}$ =6.621*

Note: Orinary least squares was used to fit each equation. The figures in parentheses are standard errors. (*) and (**) imply the F-statistics are significant at the 0.01 and 0.05 levels, respectively.

at the 0.01 level. This seems to suggest that neither interest rate was independent. However, sub-period investigations show that during the first and second fifty observation periods up to February 1980, as given in the second and third columns, there existed no mutual dependence. The third column in Table 3 suggests that there was one-way causality from the gensaki to the Euroyen rate, but the significance level is lowered to 0.05. The last column, on the other hand, shows that two-way causality became evident from March 1980. This last result is consistent with the result of Table 1.

It must, however, be noted that this test and the implication should not be considered as a test procedure designed to identify exactly when exogeneity took place. Rather, these tests are designed to prove statistically the existence or nonexistence of independence once the time period under consideration is specified.

So far we have proven the existence of two-way impacts between two chosen markets in two distant locations. Such a mutual dependence does not apply to the entire sample period but only to the 1980s. The results provide a warning: not to ignore the potential of external effects on Japanese interest rates. This market linkage has corresponded with the authorities' policy of dismantling the main restrictions over these markets. The major revision of the Foreign Exchange Law was likely to further promote such a relation. However, this legal change cannot be regarded as having initiated the financial integration of the Japanese and the Euro markets.

III. Efficiency of the Integrated Financial Markets

Transaction Costs and Efficiency

The above result can be seen as a natural tendency by which participants have sought to enjoy the wider benefits that can accrue from both markets. Whenever a market becomes more open, it is apparent that the benefits from the market cannot be limited to only some participants. This raises a related issue whether or not, and to what extent, the efficiency of short-term capital movements has been affected by the process of financial market integration.

In their pioneering work, Frenkel and Levich (1975) showed an equilibrium condition for international finance with an explicit introduction of transaction costs. Deviation from the pure interest parity condition should fall within a range determined by the size of transaction costs as long as the assets which are considered belong to a class of close substitutes in different currency denominations. These transaction costs represent a return on certain economic activities. Thus it should not be assumed that there are not transaction costs. The existence of such costs might be responsible for an erroneous interpretation that markets are inefficient. In this sespect, various parity conditions based on the assumption of cost-free arbitrage and not be correct as long as the arbitrage operation itself entails such cost.

This section attempts a calculation of the size of transaction costs, taking the arbitrage activities on the Tokyo foreign exchange market. We then use the estimated costs to assess their significance in accounting for any observed deviations from the interest rate parity condition. This approach is also useful to examine the issue on whether observed deviations from the parity band have been eliminated by the increasing international integration of Japanese financial markets.

The transaction costs associated with selling and buying financial assets across borders without foreign exchange risk exposure are summarized in a single equation

$$TC=(1-c)\ (1-c_s)\ (1-c^*)\ (1-c_f) \tag{8}$$

This formula contains four transactions because arbitragers are assumed not to hold cash: sale of domestic assets (transaction costs of c percent); spot purchase of foreign currency (transaction costs of c_s percent); purchase of foreign security (transaction costs of c^* percent); and forward sale of foreign currency (transaction costs of c_f percent).

Wquilibrium conditions of the capital outflow from domestic to foreign securities yield the lower limit on the forward premium, $FP=(F-S)/S$, for which covered capital outflow is profitable:

$$FP=\frac{(1+r^a)-TC(1+r^f)}{TC(1+r^f)} \tag{9}$$

where S and F are the spot and forward domestic currency price of foreign currency, respectively. The presence of transaction costs ($TC<1$) implies that in order to induce a profitable marginal capital outflow, the forward premium on foreign exchange must exceed the right-hand side of equation (9).

The case of covered inflow of arbitrage from the foreign to the domestic economy provides the upper limit on the forward premium for which a marginal inflow is profitable:

$$FP=\frac{TC(1+r^a)-(1+r^f)}{(1+r^f)} \tag{10}$$

Equations (9) and (10) set the limits for a 'neutral band,' as defined by Frenkel and Levich, within which covered interest arbitrage is unprofitable. Thus, there will be no incentive for covered interest arbitrage as long as the forward premium falls within the neutral band such that:

$$\frac{TC(1+r^a)-(1+r^f)}{(1+r^f)} \leqq FP \leqq \frac{(1+r^a)-TC(1+r^f)}{TC(1+r^f)} \tag{11}$$

The size of the neutral band increases with the cost of transactions. So far it has been assumed that arbitrageurs initially hold no cash but only securities. This means that to pursue covered transactions they must first sell such securities for cash. If, instead, arbitrageurs initially do hold cash, one can rewrite equations (9) and (10) and reduce transaction costs to $TC_1=TC(1-c)^2$ and $TC_2=TC(1-c^*)^2$, respectively. In this case, the estimated neutral band will, of course, be narrower and such a more conservative test will also be performed.

Estimation of Transaction Costs

The estimation procedure adopted here to assess the size of transaction costs uses data on triangular arbitrage. This approach is consistent with the way operations are conducted on the Tokyo foreign exchange market. On this market, it is commonly accepted that the U.S. dollar plays the dominant role of an intermediate currency. When we focus on the exchange rate, for example, between the yen and the U.K. pound, if transaction costs are absent, the arbitrage, involving the Tokyo foreign exchange market, ensures that

$$(¥/£)_t=(¥/\$)_t(\$/£)_t \tag{12}$$

where the terms in parentheses indicate the corresponding exchange rates, and the subscript t indicates that these prices are for foreign exchange delivered at the same maturity t.[7] If, however, there are transasction costs, the two sides of the equation could differ. We define the mean value of absolute discrepancies in percentage as transaction costs.[8] This method makes it possible to examine whether the size of the transaction costs would have varied over a period of time.

The estimated percentage costs of transaction in the foreign exchange market are summarized in Table 4. For the whole period these are 0.341 and 0.338 percent for the spot and three month forward exchange rates, respectively. Similar transaction costs for two sub-periods are given in the same table showing the costs before and after the revision of the Foreign Exchange Law of December 1980. As can be seen, there seems to be no significant change in the size of transaction costs over time. In addition,

Table 4 Transaction Costs of Spot and Three Month Forward Exchange Rate (Intermediate Currency: the U.S. $)

Sample Period	Spot Transaction ¥ and £ c_s (%)	Forward Transaction ¥ and £ c_f (%)
January 1978 to December 1983	0.341	0.338
January 1978 to November 1980	0.341	0.320
December 1980 to December 1983	0.341	0.355
Turbulent Period (78 Observations)	0.339	0.293
Calm Period (214 Observations)	0.342	0.348

Note: The costs are given in percentage of mean values of absolute deviations from triangular arbitrage when the U.S. dollar is used as the vehicle currency. All are statistically significant at 1 percent level. The data are described in the appendix.

transaction costs were estimated for another set of subperiods, called "turbulent" and "calm." The former period covers all those observations during which the yen currency price in terms of U.S. dollars had depreciated above 247 yen or had appreciated below 207 yen.[9] In this instance, too, the costs of transactions turns out to be almost the same between the two subperiods.

The general conclusion is, thus, that there seem to have been no clear changes in the size of transaction costs on the Tokyo foreign exchange market at least since 1978. This allows us to assume invariant costs associated with foreign exchange transactions.

Interest Abritrage with Transaction Costs

The three month deposit rate of the U.K. pound in the Euro market is compared with the interest rate on Japanese short-term securities for covered interest arbitrage. The estimation of the transaction cost of this external market can be made on bid-ask spread data, following the approach adopted by Frenkel and Levich (1975, 1979). During the present floating exchange rate regime, the transaction cost of the Europound, according to their study, is 0.1175 percent. This cost, as well as the cost of Eurodollar deposits, was

found to be almost invariant over the two different exchange rate regimes. Thus the cost is assumed to be held the same even in the subsequent period. However, data on bid-ask spreads in the Japanese market are not available. This means that the direct estimation of the transaction cost in the *gensaki* market is not possible. In what follows, it is simply assumed that the cost of ninety-day *gensaki* sales or purchases are 0.1 percent.[10]

The two chosen interest rates are obviously published in annualized values. Thus the data need to be transformed into quarterly valued. This procedure minimizes the margin of error contained in the estimation of transaction costs (annualization of these costs could compound any such margin of error). The covered interest arbitrage itself is a one-period model so that a ninety-day base for testing, as in our case, is superior to an annual base.

Table 5 shows the results of testing for the covered interest arbitrage between the ninety-day rates on Europounds and on Japanese domestic securities.[11] As can be seen, the covered interest arbitrage became more pronounced in the 1980s. After the revision of the Foreign Exchange Law, as shown in the third row, unexploited profit opportunities were very limited. A large number of observations in the 1970s fall outside the calculated neutral band; as can be seen in the last row. In particular, it is noted that such unbounded observations are concentrated before January 1979: in the *TC* model more than 25 percent of the sample was outside the neutral band and

Table 5 Transaction Costs and Neutral Band for Covered Interest Arbitrage—Securities Denominated in ¥ and L

Sample Period (Number of Samples)	Observations Bounded Within Neutral Band (%)	
	TC	TC′
January 1978 to December 1983	275	253
(292)	(94.18)	(86.64)
January 1978 to November 1980	127	107
(143)	(88.81)	(74.83)
December 1980 to December 1983	147	146
(149)	(98.65)	(97.99)
January 1978 to December 1979	82	65
(97)	(84.54)	(67.01)

Note: TC′ represents the conservative estimation of the transaction costs, using TC_1 and TC_2.

in the conservative *TC'* model only 44 percent of the sample was found within the band. This pre-January 1979 phenomenon corresponds to the evidence of mutual independence between the two markets during this period which has already shown in Tables 1, 2 and 3. We saw that the *gensaki* market was not systematically integrated into the Euromarket until around 1980. Table 5 corroborates the earlier findings, by indicating that the efficiency issue was not at stake until the very late 1970s.

The results of this section suggest that the importance of transaction costs should not be ignored. It is their presence which shows the increased efficiency of the *gensaki* market following upon its internationalization.

IV. Concluding Remarks

Japanese short-term interest rates were not really integrated with those of other major financial markets throughout the 1970s. The frequent criticism with regard to Japan's close market was not inaccurate. However, the tests conducted in this paper suggest that a such view is no longer appropriate in recent years. The study has shown the existence of two-way impacts between the Eurocurrency and the Japanese financial markets. As the results indicate, it is also not appropriate to adopt the so-called small country assumption for the Japanese market since there is mutual dependence between external and domestic interest rates.

The above conclusions are further supported by the fact that increasing interdependence and, therefore, efficiency on the Japanese market have been attained at a similar point in time. Such a foreign linkage was not possible without the appearance and growth of the short-term capital market in Japan. This finding corresponds to the U.S. case, where similar simultaneous dependence appeared when the Eurodollar market expanded, as shown by Hartman (1981). Both cases show that increasing integration with external markets tends to coincide with less rigid policies over domestic markets by the government. This paper's results also suggest that there is a potential for external effects to impinge on Japanese interest rates and for domestic policies to have effects on the rest of the world.

Appendix

The data used in this paper and their sources are as follows. The spot and forward exchange rates, (¥/$) and (¥/£) quoted as of Wednesday's opening rate

at the Bank of Tokyo in Tokyo, were adopted from the Bank of Tokyo Daily Exchange Rates Report. The spot and forward exchange rates of ($/£), quoted as of Wednesday's closing rate at the Bank of Tokyo in New York, were taken from the Bank of Tokyo Monthly Report. The daily average of three-month *gensaki* interest rate was from the Bank of Tokyo Monthly Report. The three month Eurocurrency interest rates, U.K. pound and Japanese yen, quoted as of Wednesday rates, were taken from the table, Facts and Figures, of *Euromoney* magazine, various issues.

Notes

1) The *gensaki* market deals with bonds sold by either dealers or nondealers under the *gensaki* agreement.
2) The specification of the model relies upon four familiar assumptions: (i) zero expected values of all disturbances, (ii) zero covariances between all noncontemporaneous disturbances, (iii) zero covariances between disturbances and exogenous variables, present or past, and (iv) the lag operator only has no roots for the stability consideration. Assumptions (ii) to (iv) are especially needed for the exogeneity specification.
3) Data sources are given in the Appendix.
4) The *gensaki* market is basically open to foreign investors, contrary to other short-term markets in Japan.
5) The test employs the lagging and forwarding operator. Therefore, each operator sacrifices four observations, as set n is equal to four in Equations (4) to (7).
6) The outstanding volume of securities on the Japanese short-term financial market expanded from 7 trillion Yen ($25 billion) in 1973 to 21 trillion yen ($91 billion) in 1983. These markets include the call-money, bill discount, CD and *gensaki* markets.
7) Other data on cross exchange rates were not obtained.
8) It seems rather questionable to adopt the maximum discrepancy between both sides of Equation (12) to correspond to the cost of one transaction. This is because the time difference between Tokyo and London is so large that the two markets have no overlapping business hours. This would make it possible for some news to influence rates quoted in London after the Tokyo market is closed.
9) The width of variation of the exchange rate bounded within the "calm" range is 17.6 percent. These criteria look arbitrary. Foreign exchange bankers, however, considered the rates outside this range, such as above, disorderly.
10) This cost seems too low compared with the cost of the external market for ninety-day U.K. pound securites. It is very likely that the yen securities market is thinner than the pound market. In this case, the *gensaki* costs may exceed the assumed level. Several dealers in Tokyo suggested that the bid-ask apread is about one fortieth of one percent. Taking Frenkel and Levich (1975, p. 330), the cost was put at 0.1 percent.

11) This case is a mixed pair which differs from the traditional and external paris in Frenkel and Levich (1975, p. 332).

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Abstract

This paper attempts empirically to examine two interrelated issues: the integration and the efficiency of Japanese financial markets. The central issue is whether the financial market of the Japanese economy has been effectively separated from the major international markets under the current exchange rate regime. The study has shown the existence of two-way impacts between the Eurocurrency and the Japanese financial markets. The conclusions are further supported by the fact that increasing interdependence and efficiency on the Japanese market have been attained at a similar point of time.